DOCUMENT RESUME

ED 163 205 CE 018 514

AUTHOR	Norrblom, Eva
TITLE	An Assessment of the Available Evidence on the Returns to Military Training.
INSTITUTION	Rand Corp., Santa Monica, Calif.
SPONS AGENCY	Advanced Research Projects Agency (DOD), Washington, D.C.
REPO T NO	R-1960=ARPA
PUB DATE	Jul 77
CONTRACT	DAHC15-73-C-0181
NOTE	46p.; Some of the tables in this document will not reproduce well due to small print
EDRS PRICE	MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS	Economic Development; Employment Opportunities; Human Capital; *Job Training; *Literature Reviews; Military Service; *Military Training; Occupational Mobility; Occupational Surveys; Research Design; *Research Methodology; Research Needs; Research Problems; *Sampling; Success Factors; *Transfer of Training
IDENTIFIERS	*Military Civilian Relationship

ABSTRACT

Thirteen studies have evaluated the potential benefits from military training that individuals gain upon leaving active duty. Despite the fact that three-fourths of military jobs have direct civilian counterparts, most of these studies indicate that military training does not have a positive effect on the civilian job opportunities for veterans. The conclusions of these studies, however, are questionable because of the methodologies and samples used. Three different approaches have been tried relying on (1) opinion survey data from separatees or retirees, (2) cross-tabulations of occupational codes comparing the military specialty of separatees with their current civilian occupations, and (3) multiple regression analysis to measure the economic benefits in civilian life that separatees derive from service training. The results have also been influenced by the use of limited samples (for example, separatees with only two years or less of active duty or only infantrymen) or by the time period in which the selected sample served their tours of duty. Because of the restricted scope of these previous studies, future research should be broadened to consider issues such as the return to training for separatees who use their military skills in the civilian sector compared to the return for those who do not; comparison between individuals in the same occupation who have military training and those who do not; and the distinction between formal and informal military training. (A bibliography is also included.) (ELG)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED163205

ARPA ORDER NO.: 189-1
7D20 Cybernetics Technology

R-1960-ARPA
July 1977

BEST COPY AVAILABLE

An Assessment of the Available Evidence on the Returns to Military Training

Eva Norrblom

A report prepared for

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

CE 018 314

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Rand
SANTA MONICA, CA. 90406

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

The research described in this report was sponsored by the Defense Advanced Research Projects Agency under Contract No. DAHC15-73-C-0181.

Reports of The Rand Corporation do not necessarily reflect the opinions or policies of the sponsors of Rand research.

Published by The Rand Corporation

PREFACE

This report was prepared as part of Rand's DoD Training and Manpower Management Program, sponsored by the Human Resources Research Office of the Defense Advanced Research Projects Agency (ARPA). With manpower issues assuming an ever greater importance in defense planning and budgeting, the purpose of this research program is to develop broad strategies and specific solutions for dealing with present and future military manpower problems. This includes the development of new research methodologies for examining broad classes of manpower problems, as well as specific problem-oriented research. In addition to analyzing current and future manpower issues, it is hoped that this research program will contribute to a better general understanding of the manpower problems confronting the Department of Defense.

This report documents part of the preliminary work undertaken for a Rand study of the economic returns to separatees from military vocational training.* A review of the relevant literature is considered an integral part of the larger study, because it provides insights into reasons for the failure of previous studies to fully evaluate and test the hypothesis that military vocational training affects the civilian opportunities of separatees.

The issue of the economic effects of military training has application in a variety of policy areas. The most obvious area is that of military manpower management. An estimation of the civilian wage offers available to potential reenlistees provides evidence on the earnings alternatives against which the services must compete. Moreover, information on the transferability of military training to the civilian sector may aid employers in assessing the capabilities of individuals with military-acquired skills. If the value of military training in the civilian sector can be measured, civilian employers and educational institutions may more readily recognize the formal and informal training gained

*Eva M. Norrblom, *The Returns to Military and Civilian Training*, R-1900-ARPA, The Rand Corporation, July 1976.

during a tour of military duty. The information provided by this study may, therefore, increase the degree of use of future military skills in the civilian sector. An increased understanding of the impact of military training on later employment in the civilian sector may also be useful in coordinating and assessing civilian and military training programs.

Finally, by providing first-term enlistees with military vocational training, the Department of Defense may be transferring real resources to the civilian sector. This study offers evidence that, if separatees use their service-acquired skills, the military's loss is partly compensated by a positive externality accruing to society. This benefit to society may be offset, however, by the additional payments imposed on taxpayers for the cost of military training.

SUMMARY

A limited number of studies have evaluated the potential benefits accruing to individuals from military training when they separate from active duty. Most of the available studies indicate that training in the military does not have a positive effect on the post-service civilian opportunities of veterans. This conclusion is reached despite evidence that more than three-fourths of the job specialties available to enlistees have direct civilian counterparts.*

The available studies interested in the effect military training has on the post-service opportunities of separatees focus on two issues. The first is the extent to which individuals utilize military-acquired skills in civilian jobs. Two very simple methodologies have generally been used in the attempt to determine the degree to which military skills are transferable to the civilian sector. These include evaluating the opinions of separatees about the degree to which they use military skills in civilian jobs or cross-tabulating the military occupational codes with the civilian occupational codes of individuals. No theoretical models of occupational choice or statistical tests of significance for the association between the military occupations and post-service occupations of individuals are provided by these studies. Moreover, since the findings of these studies vary significantly depending on the occupational groups examined, the method used to group civilian and military occupations, and the period in which the selected sample of individuals served their tours of duty, existing studies do not offer much in the way of conclusive evidence on the degree to which

*Harold F. Clark and Harold S. Sloan, *Classrooms in the Military*, Bureau of Publications, Teachers College, Columbia University, New York, 1964, pp. 103-107. Clark and Sloan indicate that 85 percent of all enlisted personnel job specialties have direct civilian counterparts and 60 percent of all military education and training is applicable directly to civilian life. Additionally, approximately 50 percent of all enlisted job specialties are classed as skilled. See also Paul A Weinstein, "Occupational Crossover and Universal Military Training," in Sol Tax (ed.), *The Draft, A Handbook for Facts and Alternatives*, University of Chicago Press, Chicago, 1967, p. 28.

military-acquired skills are used in the civilian sector. The only conclusion forthcoming from these studies is that separatees in the more technical military specialties have a higher probability of continuing to work in the same occupations when they enter the civilian labor force than separatees in the less technical military specialties.

The second issue addressed by these studies is the economic effect of military training. These studies evaluate the economic effect of military training on the civilian earnings of separatees by developing and estimating empirical models. Of the existing studies concerned with the economic effect of military training on the post-service opportunities of separatees, none have fully addressed the issue of the economic returns to military training that accrue to individuals who enter civilian occupations related to their military-acquired skills, compared to individuals who do not. Moreover, owing mainly to insufficient data, previous studies have not been able to observe the effect of formal and informal military vocational training while concurrently controlling for the effects of other factors that may influence their conclusions--such as skills acquired in the civilian sector that may be substitutes for or complements to military training. In the same context, when the military experience of individuals is viewed, in total, as simply the length of time spent in training, no consideration is given to the type of skills acquired or the intensity of formal compared to informal military training.

CONTENTS

PREFACE iii

SUMMARY v

Section
I. INTRODUCTION 1

II. OVERVIEW 3

III. STUDIES OF THE TRANSFERABILITY OF MILITARY SKILLS 9
Studies Using Opinion Survey Data 9
Studies Using Cross-Tabulations of Occupational Codes 18
Summary 23

IV. STUDIES USING STATISTICAL TECHNIQUES TO DETERMINE IF SEPARATEES RECEIVE ECONOMIC RETURNS TO MILITARY TRAINING 26
Introduction 26
Studies That Compare Different Cohorts of Veterans 26
Studies That Compare Veterans with Nonveterans 29
Summary 30

V. ON-GOING RESEARCH ON THE RETURNS TO MILITARY TRAINING 32

BIBLIOGRAFHY 35

I. INTRODUCTION

This report reviews the available literature on the benefits from military vocational training accruing to enlistees when they separate from the service. The study is part of a larger effort conducted at Rand that focuses on the economic effects of military training on the post-service opportunities of enlistees. A review of the literature is considered to be an integral part of the larger effort, because it provides information on the extent to which the relevant hypotheses have been addressed. This literature review also compares and synthesizes the methods and assumptions employed by previous studies concerned with the returns to separatees from vocational training acquired in the military.

The available studies of the effect of military service on the civilian opportunities of separatees may be categorized into two distinct theoretical frameworks including that of occupational choice and human capital theory. Of the studies that focus, at least partially, on the occupational choice of separatees, none go beyond calculating a simple distribution across occupations to indicate the percentage of separatees who enter civilian occupations related to their military jobs. No attempt is made by these studies to develop a theoretical model of occupational choice. On the other hand, studies of the effects of military training on the civilian earnings of individuals are based on a theoretical model generally referred to as the human capital approach. The human capital approach provides theoretical and empirical models in which investments in training are a central explanatory factor leading to the observed inequality of labor income. Training raises productivity and is acquired by individuals who expect the returns to training to compensate for the costs of training. If military training does affect the productivity of individuals, wages will depend, in part, on the type and amount of military training individuals have acquired. Consequently, the observed wages of individuals are used to determine

whether investments in various types and amounts of training yield private returns to recipients.*

To allow a comparison across studies concerned with each of the above two issues, the simple question of transferability and the economic returns to training, this literature review is divided into sections according to the issues addressed and the methodologies used. There are essentially three methodologies that have been used by existing studies to assess the economic effect of military service. Studies interested in determining the extent to which separatees are able to use their military-acquired skills in post-service jobs use either the opinions of separatees obtained through surveys or cross-tabulations of the military-acquired skills of separatees with their chosen civilian occupations. These studies are discussed in Sec. III. The third method, employing multiple regression analysis or, on a less sophisticated level, comparing the mean earnings of various groups, is generally used to determine if military training has a positive effect on the civilian wages of veterans. These studies are discussed in Sec. IV. Finally, Sec. V presents one important facet of Rand research on this subject in more detail.

---

*Although wages may reflect, in part, a credential effect, arguments against established labor theory have been debated extensively without offering sufficient supporting evidence. For a discussion of the credential effect, refer to Taubman and Wales.

II. OVERVIEW

A description of the data sources, the methodologies, and the principal findings of the relevant studies is presented in Table 1.* As discussed above, these studies generally rely on three principal methodologies to evaluate the effects of military training on the civilian opportunities of veterans.

Eight of the thirteen available studies use the opinions of separatees to some extent in formulating their conclusions. These studies include the ones by the U.S. Senate Committee on Armed Forces, Richardson (1966), Sharp and Biderman, Nathan Associates, Thorndike and Hagen (1957), McCall and Wallace, Weinstein et al., and Freeman. The first three of these studies are primarily concerned with the vocational readjustment problem faced by separatees. The emphasis is on the *general* transferability of the military experience of individuals to the civilian labor market rather than on the transference of specific military skills to related civilian jobs. In all three of these studies, half or more of the technically trained separatees felt their military backgrounds helped them qualify for civilian jobs. These studies also indicate that separatees trained in military skills that have civilian counterparts have less difficulty in securing employment in the civilian sector.

The next three studies, using opinion survey data, present evidence on the extent to which separatees enter civilian occupations directly related to their military-acquired skills. Using a sample of military-trained medical care specialists, Nathan Associates found that one-fifth of the sample respondents entered related civilian occupations. Similarly, Thorndike and Hagen (1957) found that approximately one-fifth to two-fifths of the separatees with training in the more technical military specialties entered related civilian occupations. In contrast, a much

*A number of the studies to be discussed are interested in both the use of military skills in the post-service period and the effect of military training on earnings. The available studies are therefore included in each of the relevant sections below.

Table 1

SUMMARY TABLE OF DATA USED IN PREVIOUS STUDIES.

Study	Data Source and Sample Size	Branch of Service	Length of Service	Timing of Survey After Separation Date	Period of Service
Sharp and Biderman	1965[a] survey: Pre-retirement (2094); 1st post-retirement (346); 2d post-retirement (1665) 1963 DoD survey (11,985)	Retirees: Army Air Force Navy	20 years or more	6 mo to 1 year	Pre-WWII
Cutright	Selective Service 1% sample of April 1953 linked with SSA[b] data (5972 whites and 1650 blacks).	Veterans (primarily inductees)	2 years	3-4 years and 9-10 years	Korean War
Freeman	1966 Department of Labor's National Longitudinal Survey (Parnes tape) of men aged 45-59 (1760).	Army veterans	Not specified	Not specified	Pre-WWII and WWII
Hanushek	DoD Post-Service Information File of 180,000 civilian-employed separatees.	Army veterans (primarily inductees)	2 years	10 mo	1966-1967
Kassing	Selective Service 1% sample of April 1953 linked with SSA data (8104). Data from the study by Weinstein et al. (item #9 in this table) (2313 Army and 1084 veterans).	All veterans	One term	3-4 years and 9-10 years	Korean War
McCall and Wallace	1966 survey of civilian-employed separatees (505).	Air Force electronic specialists	One term	2 years	1958-1972
Mason (1970)	1964 Current Population Survey; and CPS and DoD Survey (3045 veterans and 6548 nonveterans).	Veterans (enlistees)	Not specified	Variable	Post-WWII
Nathan Associates	Telephone interviews (100 Army, 106 Navy, and 100 Air Force veterans).	Enlistees: Army Air Force Navy	One term	2-3 years	Early 1960s.
Weinstein et al.	Service records and telephone interviews with civilian-employed standby reservists (2313 Army and 1084 Navy veterans).	Army and Navy veterans	One term	2-4 years	Late 1950s and early 1960s
Richardson (1967)	Interviews (412).	Air Force veterans (enlistees)	One term	2 years or less	Early 1960s
Thorndike and Hagen (1957)	Interviews and mail questionnaires (3005).	Air Force veterans (enlistees)	One term	1 year or more	Korean War
U.S. Senate Committee on Armed Forces	DoD mail questionnaires (3168).	Air Force officers on the retiree roles in 1961	20 years or more	1-6 years	Late 1930s and early 1940s
Winkler and Thompson	DoD Post-Service Information File of 1968-1970 separatees (85,409).	Air Force veterans (enlistees)	One term	1-1/2 years or less	1964-1966

NOTE: Footnotes appear at the end of the table.

Table 1 (cont.)

Study	Primary Purpose of the Study	Method Used to Analyze the Effects of Military Training	Conclusions on the Economic Effects of Military Training
Sharp and Biderman	Analyze the vocational readjustment problems of military retirees entering the civilian sector.	Opinions of retirees and cross-tabulations of military and civilian occupations. Civilian occupations are classified by industrial codes. Military occupations are classified by 1-digit DoD codes.	1/3 to 1/2 of the separatees were working in civilian jobs comparable to their military specialty. Separatees with training in military specialties with civilian counterparts have fewer problems securing post-service jobs. Educational achievement and personality-type qualifications are the most important factors in the occupational adjustment of separatees.
Cutright	Analyze the determinants of earnings and changes in earnings and measure the effect of military service on post-service earnings.	A comparison of veterans and nonveterans. Two data points are also used to determine if the effect of military training changes over time. Occupational groups are not considered separately.	The earnings of veterans are not higher than the earnings of comparable nonveterans.
Freeman	Analyze the effect of military and civilian occupational training and job experience on civilian earnings.	Opinions of separatees and regression analysis using earnings data. Civilian occupations are defined by broad industrial codes and Army specialties are aggregated without regard to type or intensity of training.	Military training does not have a significant effect on earnings. Roughly 2/3 of those working use their civilian institutional training in their civilian job, whereas only 1/3 of the veterans use their Army training.
Hanushek	Analyze the differential in earnings across geographical labor markets.	Regression analysis using earnings data. Civilian occupations are defined by 1-digit DOT[c] codes and military occupations by 1-digit DoD codes.	Military service does not have a significant effect on the earnings of veterans.
Kassing	Assess the available evidence on the benefits from military vocational training and determine if veterans fare better than nonveterans.	Regression analysis using earnings data. Separatees from 9 major military occupational groups are compared with infantrymen. Veterans are also compared with nonveterans.	Military vocational training does not result in a higher wage for veterans with technical training compared to those without technical training. The earnings of veterans are not higher than the earnings of comparable nonveterans.
McCall and Wallace	Analyze the responsiveness of reenlistment rates to changes in remuneration and the transferability of Air Force training to the civilian sector.	Opinions of Air Force trained electronic specialists and regression analysis using earnings data. Veterans who use their military training in their civilian jobs are compared with veterans who do not.	2/3 of the civilian-employed Air Force separatees use their military skills in their civilian jobs. Veterans who use their military training receive higher post-service wages than separatees who do not use their military training.
Mason (1970)	Analyze the effect of military vocational training on the socioeconomic status of veterans.	Cross-tabulations of military and civilian occupations and regression analysis. The comparability of military and civilian skills is defined by ratings of the socioeconomic standing of broad military and civilian occupational groups. Veterans are compared with nonveterans.	Military service does affect socioeconomic status but this effect operates through an increased educational level of veterans. Lower status men use their military training to a greater extent in their post-service jobs.

Table 1 (cont.)

Study	Primary Purpose of the Study	Method Used to Analyze the Effects of Military Training	Conclusions on the Economic Effects of Military Training
Nathan Associates	Analyze the transferability of military-acquired medical skills to the civilian sector.	Opinions of military-trained medical specialists and comparisons of earnings data. Veterans who use their military training in their civilian jobs are compared with veterans who do not.	Separatees who use their military-acquired medical training earn more than separatees who enter unrelated post-service occupations. 1/5 of separatees entered civilian jobs comparable to their military occupation. The nontransference of military skills is due primarily to the lack of recognition of military medical skills by the civilian sector.
Weinstein et al.	Analyze the benefits from military vocational training.	Opinions of separatees, cross-tabulations of military and civilian occupations and regression analysis using earnings data. Separatees are classified into 9 major military groups and are compared with infantrymen.	1/6 of the Army and 1/4 of the Navy separatees use their military training in their civilian jobs. Military vocational training is not a significant determinant of the post-service wages of separatees.
Richardson (1967)	Analyze the vocational readjustment problems of veterans entering the civilian sector.	Opinions of separatees and cross-tabulations of military and civilian occupations. Civilian occupations are classified by a 1-digit DOT code. Military specialties are divided into 2 major groups and are also presented by 2-digit Air Force Specialty Codes.	1/2 of the separatees use their military training in their civilian job. Although enlistees with certain types of training are able to use their military-acquired skills in the civilian sector, there is no strong relationship between Air Force training received and the post-service job chosen by separatees.
Thorndike and Hagen (1957)	Analyze the reasons for low retention rates in high-skill groups.	Opinions of separatees and cross-tabulations of military and civilian occupations. Civilian occupations are coded by the 1948 DOT classifications and military specialties by 2-digit Air Force Specialty Codes.	Depending on the military specialty, 1/3 to 1/5 of the separatees reported they entered civilian jobs related to their Air Force training.
U.S. Senate Committee on Armed Forces	Analyze the reasons retirees have problems securing jobs in the civilian sector.	Opinions of separatees. Responses are presented by 11 military skill groups.	The military-to-civilian transfer problem is not so much a result of unmarketable skills but rather one of relating the skills gained in the military to civilian counterparts.
Winkler and Thompson	Analyze the extent of utilization of military skills in the civilian sector.	Cross-tabulations of military and civilian occupations. Civilian occupations are classified by 2-digit and 3-digit DOT codes and military skills by 5-digit Air Force Specialty Codes.	Military skills are transferable to the civilian sector, especially if they are associated with a high degree of technical training. Up to 4/5 of the separatees from more technical military specialties entered related post-service occupations.

[a] Bureau of Social Science Research.

[b] Social Security Administration.

[c] Dictionary of Occupational Titles.

higher percentage of skill use of Air Force-trained electronic specialists is reported by McCall and Wallace. Approximately two-thirds of those who left the Air Force and entered civilian jobs use their Air Force training.

In the process of analyzing the economic returns to training, Weinstein et al. and Freeman also discuss the extent of skill use reported by individuals in their samples. Both studies report that, on the average, one-fifth to one-third of the separatees with training use their military-acquired skills in their post-service jobs. In addition, Weinstein et al. indicate that a larger percentage of separatees from the more technical military specialties enter related post-service occupations.

The second method, which is used by the remaining five out of the thirteen studies evaluating the transferability of military skills, is to cross-tabulate the military specialties of separatees with their civilian occupations. By such cross-tabulating, Winkler and Thompson find from their sample that military training is transferable to the civilian sector. They conclude, as do many of the above studies, that use of military skills is higher for separatees trained in the more technical military specialties. Across military occupational groups the percentage of skill utilization ranges from approximately 8 percent to 80 percent. The other four studies cross-tabulating military and civilian occupational codes categorize occupational groups on a highly aggregated basis (Massell and Nelson, Richardson (1966), Sharp and Biderman, and Thorndike and Hagen (1957)). As a consequence, it is difficult to observe whether separatees with more technical training have a greater tendency to use their military-acquired skills in post-service jobs. In general, these studies find that less than one-third of the separatees enter civilian occupations related to their military specialties.

In addition, eight of the above studies go beyond the issue of skill utilization to evaluate the economic effects of military training using statistical techniques. Of these studies, six conclude that military vocational training does not have a positive effect on the post-service wages of separatees. Freeman, for example, finds that although

civilian vocational training has a positive effect on earnings, military vocational training does not. Weinstein et al. also conclude that veterans do not receive a positive economic return from military vocational training. Mason (1970), Hanushek, Cutright, and Kassing reach similar conclusions. Classifying military and civilian occupations by rankings of socioeconomic status, Mason (1970) finds that the military occupations and lengths of service of veterans do not have a positive association with civilian earnings. Similarly, Cutright and Kassing find that veterans are not better off than nonveterans as a result of having acquired military occupational training. In comparison, McCall and Wallace and Nathan Associates indicate that *separatees who enter military-related civilian occupations* earn more, on the average, than separatees who did not acquire military skills related to their post-service occupations.

The conclusions reached in the above studies depend on the samples selected and the manner in which the data available to each study are evaluated or analyzed. Sections III and IV present a detailed discussion of previous studies of the effect of military vocational training on the post-service opportunities of separatees. The sections are organized on the basis of the methods and samples used by each study.

III. STUDIES OF THE TRANSFERABILITY OF MILITARY SKILLS

Studies that depend of the opinions of veterans or on cross-tabulations of military and civilian occupational codes to evaluate the extent to which military skills are transferable to the civilian sector use samples of separatees or retirees from the Army, Navy, or Air Force. The following discussion outlines, in detail, the samples and conclusions offered by these studies.

STUDIES USING OPINION SURVEY DATA

Studies of Army and Navy Separatees

Two of the existing studies use survey data from interviews with separatees (Weinstein et al. and Freeman). The major concern of the effort by Weinstein et al. is the effect of military vocational training on the earnings opportunities of enlistees when they separate from military service. The sample used consists of civilian-employed stand-by reservists who separated from active duty between 1960 and 1965 after one term of service. Data were taken from Army and Navy service records and telephone interviews for which response rates of 41 percent for the Army and 28 percent for the Navy were obtained. Veterans who served less than two years of active duty were excluded from the sample.

Separatees were asked if they looked for and accepted jobs similar to their military training. One-third of the Army and one-half of the Navy separatees who looked for related civilian jobs actually entered civilian occupations in which they could use their military-acquired skills (see Table 2a). Approximately one-sixth of the Army sample and more than one-fourth of the Navy sample use their military training. Of these separatees approximately one-half of the Army veterans and three-fourths of the Navy veterans reported their military experience helped them obtain a pay advantage or a better job position in the civilian sector (See Table 2b). For skills that require the most intensive amount of training almost one-half of the separatees entered civilian occupations connected with their military-acquired skills.

Table 2a

ATTEMPT TO GET CIVILIAN JOB RELATED TO MILITARY EXPERIENCE, BY MILITARY CAREER FIELDS

Military Specialty	Sample Size	Percent of Total		
		Who Looked	Who Found	Who Took
Army				
Police	216	34.1	24.0	14.1
Data processing	114	64.7	50.0	42.3
Operative-construction	241	29.1	17.8	16.7
Operative-repair	232	40.6	26.8	20.5
Telephone trades	78	53.8	34.5	25.1
Teamster	121	25.9	11.7	8.3
Esoteric skills	99	27.2	14.6	6.8
Combat infantry	202	15.3	10.0	6.8
Duty soldier	70	15.4	5.8	5.8
Clerical	568	39.3	22.8	14.2
Total Sample	1941	34.0	21.5	15.9
Navy				
Operative		75.6	46.7	37.8
Telephone trades		76.1	50.0	31.3
Aircraft mechanics		58.7	38.5	23.8
Teamster		58.9	44.5	35.6
Esoteric I (electronic)		72.8	55.8	44.4
Esoteric II (mechanical)		46.3	30.1	17.6
Weapons		38.8	29.1	24.8
Clerical skills		41.4	20.7	17.6
Boatswain's mate		18.5	9.2	7.7
Total Sample	1084	55.8	38.5	28.6

SOURCE: Weinstein et al,, Tables V-3a and V-3b, pp. 94-95.

Freeman's study focuses primarily on the returns to formal training. He draws on the data available from the U.S. Department of Commerce, *National Longitudinal Survey*, for men aged 14-24 and 45-59. Interviewees were asked if they use their formal civilian or military vocational training in their jobs. While two-thirds of the working nonveterans reported they use their civilian institutional training, slightly more than one-third of those with Army training indicated their military skills are used in their civilian jobs. In this sample, however,

Table 2b

BENEFITS TO VETERANS EMPLOYED IN CIVILIAN JOBS
COMPARABLE TO THEIR MILITARY SPECIALTY

Military Specialty	Sample Size	Benefits Reported by Separatees		
		Pay	Job Title	No Help/ Don't Know
Army				
Police	31	35.5	9.7	54.8
Data processing	49	59.2	12.2	28.6
Operative-construction	41	20.0	6.7	73.3
Operative-repair	48	31.3	14.6	54.2
Telephone trades	20	43.8	13.3	43.8
Teamster	11	11.8	17.6	70.6
Esoteric skills	7	28.6	57.1	14.3[a]
Combat infantry	14	35.3	5.9	58.8
Duty soldier	4	25.0	25.0	50.0[a]
Clerical	81	25.5	21.3	53.2
Total Sample	306	34.9	15.1	51.0
Navy				
Operative		67.6	8.8	23.5
Telephone trades		53.8	23.1	23.1
Aircraft mechanics		64.0	16.0	20.0
Teamster		37.5	18.8	43.8
Esoteric I (electronic)		61.4	19.3	19.3
Esoteric II (mechanical)		45.8	25.0	29.2
Weapons		64.7	17.6	17.6
Clerical skills		54.2	12.5	33.3
Boatswain's mate		50.0	0	50.0[a]
Total Sample	310	56.8	17.1	26.1

SOURCE: Weinstein et al., Tables V-6 and V-7, pp. 105-106.

[a]Based on less than 5 observations.

veterans in the older age group received their military training during World War II, when many of the military skills did not have direct civilian counterparts and a large percentage of military men were trained for combat. In addition, a large percentage of the younger males probably consists of veterans from the infantry who did not receive military training in skills with civilian counterparts. Since information on

the type or amount of military training acquired by each individual in the sample is not available, the percentage of separatees who utilize civilian-related military skills may be underestimated.

Studies of Air Force Separatees

Three studies of Air Force separatees who left the military after one term of duty are available. Thorndike and Hagen (1957) address the issue of benefits from military vocational training in the context of the civilian competition the Air Force must face for its technicians. They are primarily interested in dealing with the problem of low retention rates in high skill groups. As in the above two studies using Army and Navy data, the value of military training to separatees is evaluated by interviewing veterans.

Thorndike and Hagen's sample consists of 3005 Air Force enlistees from six selected military specialties. The separatees interviewed began their tours of duty around the time of the Korean War and had been out of the service for approximately one year at the time they were interviewed. A response rate of 65 percent was obtained for Thorndike and Hagen's survey. According to the survey responses, a large percentage of the separatees did not attempt to find civilian jobs related to their military specialties. Many felt related jobs were not available or they did not like their Air Force specialty and returned to pre-service jobs.

Only one-sixth of the sample in Thorndike and Hagen's study accepted related civilian jobs upon separation from the service (see Table 3). In higher-skilled areas approximately one-fifth to one-third of the separatees found civilian occupations comparable to their military jobs. In the sample surveyed by McCall and Wallace, a significantly higher percentage of the separatees entered related civilian occupations. Although McCall and Wallace deal primarily with the responsiveness of reenlistment rates to changes in remuneration, they also attempt to measure the degree to which Air Force training is transferable to the civilian sector by asking interviewees if their Air Force experience is used in their civilian jobs. Their survey of 505 Air Force electronic specialists who left the service in 1962 and who were

Table 3

ATTEMPT TO GET CIVILIAN JOB RELATED TO AIR FORCE EXPERIENCE

Primary Specialty	Sample Size	Percent of Total			Percent of Those Who Looked Who Took
		Who Looked	Who Found	Who Took	
Air traffic control and warning	428	24.0	3.7	2.8	15.2
Communications	441	36.6	8.6	7.7	23.0
Radio and radar systems maintenance	461	57.5	36.0	34.9	59.8
Armament systems maintenance	468	46.3	26.0	24.1	55.2
Aircraft and engine maintenance	443	53.9	23.7	21.2	42.6
Food service	342	36.4	13.2	12.6	40.1
Supply	422	36.0	12.5	10.4	30.7
Total All Specialties	3005	40.6	18.1	16.6	

SOURCE: Thorndike and Hagen (1957), Table 34, p. 54.

employed in 1964 received a response rate of 60 percent. Approximately two-thirds of the interviewed Air Force-trained electronics specialists use their Air Force training. Contrary to Thorndike and Hagen, McCall and Wallace conclude that military training *is* transferable to the civilian sector. Since the military and civilian occupational structures have been shown by Wool (1959), Biderman and Sharp, and others to be converging over time, McCall and Wallace's sample of 1962 Air Force separatees may be more indicative of the current opportunities available to separatees than the sample of early 1950 Air Force veterans in Thorndike and Hagen's study.* Wool (1959), for example, reports that from the end of World War II to 1960 the percentage of individuals employed in military combat specialties without civilian counterparts decreased by approximately 57 percent (Table 4).†

*Also see Wool (1969).

†The returns to military training may increase if military and civilian occupational structures do continue to converge over time.

Table 4

DISTRIBUTION OF ENLISTED JOBS BY OCCUPATIONAL GROUPS
(In percent)

Major Military Occupational Group	End of WW II	During Korean War	Dec 1958	Dec 1960
Electronics	6.2	9.6	13.5	13.7
Other technical	6.9	6.9	7.4	7.4
Mechanics and repairmen	21.3	22.6	25.8	24.8
Administrative and clerical	15.3	20.8	20.6	20.7
Crafts and services	26.7	22.7	19.4	19.6
Group combat	23.6	17.4	12.9	13.4
Total	100.0	100.0	100.0	100.0

SOURCE: Wool (1959), p. 166.
NOTE: Excludes trainees and other personnel not identified by occupation.

Another Air Force study by Richardson (1966) is concerned with the vocational readjustment problems of military separatees entering the civilian sector. The data used by Richardson are provided by interviews with Air Force officers and enlistees who separated from the military in 1965 and 1966. The response rate for the survey is 62 percent. Approximately one-half of the enlistees who separated from active duty after one term of service reported they use their military training a great deal in their civilian jobs (see Table 5). As with the study by Weinstein et al., Richardson found that veterans from military specialties requiring more training tend to make greater use of their military-acquired skills.

Over one-fourth of the enlisted separatees in Richardson's sample felt that their military training helped their performance in their

If so, studies using longitudinal data should explicitly consider the period in which individuals in the selected samples served their tours of military duty.

Table 5

UTILIZATION OF MILITARY TRAINING IN POST-SERVICE CIVILIAN JOBS
(In percent)

Degree of Skill Utilization	Crafts and Technical	Military Services	Total[a]
Great Deal	32.2	47.2	39.7
Somewhat or very little	57.6	38.9	48.2
Not at all	2.4	4.1	2.9
Self-employed or no response	7.8	8.9	8.2
Total	100.0	100.0	100.0

SOURCE: Richardson (1966), Table 31, p. 172.
NOTE: The sample consists of 418 separatees.

post-service jobs and also aided them in securing those jobs. Of course, to judge the value of military training in securing civilian jobs, employers would also have to be contacted. Military training in a skill, for example, may make a potential employer more willing to hire a veteran if it is thought that the necessary on-the-job training would be less extensive.

Although peripheral to the studies of first-term enlistees, additional information, at least for the purpose of comparison, may be obtained from two available studies that focus on military careerists. The studies by Sharp and Biderman and by the U.S. Senate Committee on Armed Forces examine the vocational readjustment problems of military retirees when they enter the civilian sector. Sharp and Biderman's survey of May 1961 Army, Navy, and Air Force retirees with 20 or more years of active duty yielded a response rate of over 60 percent. Information from a second survey of retirees conducted by the Department of Defense is also used in Biderman and Sharp's study. Over one-half of the respondents from the two surveys reported that they use their military skills in the civilian sector to a greater extent or at least as much as they did in their military jobs (see Table 6). One-half of the job holders in the sample of retirees felt their military backgrounds helped them qualify for their civilian jobs.

Table 6

UTILIZATION OF MILITARY SKILLS
IN CIVILIAN JOBS
(In percent)

Degree of Skill Utilization	BSSR[a] Sample (N=1152)[b]	DoD Sample (N=1871)[c]
Greater	31.0	30.0
Same	22.0	20.0
Less	29.0	50.0
None	18.0	--
Total	100.0	100.0

SOURCE: Sharp and Biderman, Tables 138 and 142, pp. 197, 203.

[a]Bureau of Social Science Research.

[b]Excludes (71) no answers.

[c]Excludes (40) no answers.

The study by the Senate Committee on Armed Forces is concerned with the general transferability of military skills to the civilian sector rather than with the employment opportunities of retirees with specific occupational skills. A mail questionnaire was sent to all Air Force officers on the retiree rolls in March and April of 1961 who left the service between 1955 and 1960. The 3,168 responses received indicate a response rate of 74 percent. More than one-third of the sample used by the Senate Committee on Armed Forces reported their military backgrounds improved their performance in their civilian jobs. The military-to-civilian transfer problem was found to be not so much a result of unmarketable skills but rather one of retirees' matching up civilian job descriptions with their military skills and providing potential employers with this information.

Summary of Conclusions Based on Interviews With Separatees

Studies that use opinion survey data to determine the degree of military skill use in the civilian sector indicate that the percentage of separatees who use their military skills in their civilian jobs ranges

from approximately one-sixth to three-fourths of the sample respondents. Moreover, skill utilization tends to be higher for military specialties that are associated with more extensive amounts of technical training.

The studies discussed above may be subject to severe limitations. Any evidence presented implying that military training has a positive effect on the post-service opportunities of separatees is based on the subjective evaluations of veterans questioned. If interviewees separated from the military because of their distaste for military service, their responses to the survey may be biased.* Moreover, the gains from military training may be so subtle that some separatees cannot recognize the effect military training has on their post-service opportunities.

Four of the studies reviewed use data on separatees who received their military training during World War II or the Korean War when military training was more oriented toward combat skills. Since draftees are legally entitled to return to their pre-service jobs after completing their tours of duty, the data may indicate a larger percentage of separatees do not enter service-related jobs, if inductees are included in the sample. The study by Weinstein et al., for example, found that one-half of the Army separatees but only one-sixth of the Navy separatees returned to their pre-service jobs. Since the Army sample is composed of about three-fourths inductees or draft-induced enlistees, the percentage of skill utilization for Army separatees with formal military vocational training that could potentially be used in civilian jobs may be underestimated in the studies by Weinstein et al. and Freeman. The failure of separatees to enter civilian jobs in which they can use their military-acquired skills could also be a consequence of enlistees not being assigned to their preferred military specialty.†

---

*For careerists, a bias in the opposite direction may be present.

†Harding and Richards. Assignment to a preferred military specialty may not occur if: (1) physical, mental, and educational requirements are not met, (2) quotas for the preferred areas of training and duty have been filled, (3) the enlistee is well-qualified for an area in which the service has an insufficient supply of manpower, and (4) the enlistee does not have enough information about each military specialty.

As an alternative to the use of survey opinions, some studies use occupational codes to tabulate the degree to which veterans use their military-acquired skills. The conclusions reached by these studies are reported in the next subsection.

STUDIES USING CROSS-TABULATIONS OF OCCUPATIONAL CODES

A second technique used to determine the extent to which military skills are transferable to the civilian sector is to compare the military specialty of separatees with their current civilian occupation. Cross-tabulations of civilian and military occupational codes indicate that skill utilization ranges from approximately 8 to 100 percent, depending on the amount of technical training associated with an occupation.

Studies of Separatees Using Detailed Occupational Groups

Winkler and Thompson have provided the most detailed and extensive cross-tabulations of the relationship of civilian and military jobs. The comparability of military and civilian occupations and the extent to which military skills are used in the civilian sector are evaluated by using two-digit and three-digit DOT codes and five-digit Air Force Specialty Codes (see Table 7).* Occupational codes are grouped together on the basis of job characteristics. The data used are extracted from the Post-Service Information File. The selected sample includes Air Force enlistees who left the service between 1968 and 1970 after serving one term of military duty.

Winkler and Thompson indicate that in two-thirds of the Air Force specialties, more than one-fourth of the respondents use their military skills in their civilian occupations. Thirteen of the thirty-three

---

*U.S. Department of Labor (1965). Of the currently available classifications of occupations, DOT codes appear to be the most useful for the issues addressed here. The DOT was constructed from a sample of 4000 jobs in 1950 by the Bureau of Employment Security. The first digit of the DOT code signifies the major occupational group, the second indicates the function of the group, and the third digit a more detailed subject matter. For example, DOT 720 is defined as:

7 = benchwork occupations
2 = occupations in assembly and repair of electrical equipment
0 = occupations in assembly and repair of radio and television receiving sets and phonographs.

Table 7

POST-SERVICE UTILIZATION OF TRAINING IN 43 AIR FORCE CAREER FIELDS

Air Force Specialty	Number of Observations (Total=85,409)	Percent Post-Service Population	Related DOT Codes[a]	Total Skill Utilization
Intelligence (20)	1,467	1.71	02,13,17,18,19,20 21,23,24	30.4
Photomapping (22)	449	0.52	01,02,14,24,97	53.2
Audiovisual (23)	635	0.74	14,18,19,96,97	32.9
Weather (25)	415	0.48	02,21,23	17.6
Command control systems operation (27)	2,354	2.75	19,21	22.4
Communications operations (29)	3,909	4.57	19,20,21,22,23,37 72,82	31.2
Communications-electronics systems (30)	8,700	10.18	00,72,82	52.0
Missile electronics maintenance (31)	446	0.52	00,82	39.0
Avionics systems (32)	1,792	2.09	00,63,71,72,82	49.4
Training devices (34)	281	0.32	00,09,71,72,82	43.4
Wire communications systems maintenance (36)	1,354	1.58	00,31,63,82	51.1
Intricate equipment maintenance (40)	348	0.40	00,63,71,72,82	44.6
Aircraft accessory maintenance (42)	4,119	4.82	62,63,71,72,80,82,86	38.8
Aircraft maintenance (43)	13,637	15.96	01,62	17.2
Missile maintenance (44)	254	0.29	62,70,82	20.9
Munitions and weapons maintenance (46)	3,380	3.95	22,60,63,69,72,80,82,92	27.4
Vehicle maintenance (47)	1,737	2.03	62,63,70,80,84	30.4
Metal working (53)	1,439	1.68	50,60,61,62,72,80,81,84	47.2
Civil engineering mechanical/electrical(54)	2,133	5.49	62,63,72,82,83,91,95	43.8
Civil engineering structural/pavement (55)	3,016	3.53	00,01,16,21,22, 57,84,85,86,92	34.2
Civil engineering sanitation (56)	275	0.32	04,17,38,55,95	17.4
Fire protection (57)	1,354	1.58	37,70,73	19.9
Fabric, leather, and rubber (58)	279	0.32	74,78,84,91	9.0
Transportation (60)	4,367	5.11	22,35,90,91,92	24.7
Supply services (61)	313	0.36	18,22,29,31,52	27.8
Food services (62)	1,351	1.58	31,52	7.7
Fuel services (63)	1,672	1.95	18,22,90,91,92	27.3
Supply (64)	5,568	6.51	16,18,21,22,23,92	41.1
Procurement (65)	136	0.15	16,18,21,22	59.6
Accounting and finance, and auditing (67)	1,004	1.17	16,18,21	48.4
Data systems (68)	958	1.12	01,02,16,20,21	79.8
Administration (70)	5,075	5.94	10,11,16,18,20,21 22,23,24	41.3
Printing (71)	173	0.20	20,65,80,97	49.7
Personnel (73)	1,244	1.45	04,16,18,20,21,22,23	46.3
Special services (74)	276	0.32	09,15,18,19,96	17.0
Education and training (75)	197	0.23	04,09,10,11,16,18,22, 25,37,96	26.9
Information (79)	291	0.34	05,13,14,15,16,18	54.6
Security police (81)	5,506	6.44	18,37	17.7
Band (87)	174	0.20	10,15	19.5
Medical (90)	1,992	2.33	07,10,16,19,21,23 26,35,55	35.2
Medical (91)	351	0.41	07,18,19,21,22,35,71	35.6
Aircrew protection (92)	286	0.33	16,18	9.8
Dental (93)	338	0.39	07,16,18,28,71	24.0

SOURCE: Winkler and Thompson, Tables 12-13, pp. 12-13.

[a]Two-digit DOT code used to determine utilization rather than three-digit code from Air Force Manual (AFM)-39-1.

career fields with a variable reenlistment bonus (VRB) level of four have utilization rates ranging from 50 percent to 100 percent (see Table 8).* For the remainder of these career fields, approximately one-third of the separatees entered related civilian occupations. Thus Winkler and Thompson conclude that military skills are transferable to the civilian sector, especially if they are associated with a high degree of technical training.

Studies of Separatees Using Broad Occupational Groups

The other studies that use DOT codes to classify the relationship between military and civilian occupations cross-tabulate occupations by much broader groups. Using data obtained from the Post-Service Information File and the End-of-Service File (tape), which include separatees who served one term of active duty and who separated from the military in 1971, Massell and Nelson cross-tabulate the civilian occupations of separatees with their military specialties (Table 9). In contrast to Winkler and Thompson, Massell and Nelson report that the use of military-acquired skills is not significantly high. Of the military specialties included in their analysis, mechanics have the highest probability of entering related civilian occupations, with approximately 25 percent of the separatees employed in comparable post-service jobs. In comparison with Winkler and Thompson, Massell and Nelson use primarily one-digit DOT codes. Consequently, within any one group, the skills are more mixed as to job content. That is, one-digit DOT codes include a greater diversity of skills than two-digit and three-digit DOT codes. The professional group, DOT 0 and DOT 1, for example, includes such diverse occupations as engineers, physicians, artists, pilots, and teachers. The cross-tabulations presented in the studies by Richardson and by Sharp and Biderman, which are discussed above, illustrate the difficulty encountered in determining if individuals entered civilian occupations comparable to their military specialties in

*A variable reenlistment bonus of four indicates that the military specialty requires an extensive amount of technical training and that the military services are faced with a shortage of trained manpower in the skill area.

Table 8

UTILIZATION OF AIR FORCE-GAINED SKILLS IN CIVILIAN OCCUPATIONS FOR AIR FORCE SPECIALTIES WITH A VRB OF FOUR

DoD	Air Force Specialty Codes	DOT Codes[a]	Percent Total Utilization
101	Tele-communications systems control specialist/attendant	72,82,003,633	50.3
102	Aircraft sensor systems repairman	82,003,633	44.1
122	Missile systems analyst	82,633	42.0
122	Instrumentation mechanic	00,82	53.2
160	Electronic communication & cryptographic equipment systems repairman	82,003,633	61.1
191	Television equipment repairman	72,82,003	48.5
191	Instrument trainer specialist	09,71	25.0
191	Flight simulator specialist	09,71,72,82,003	38.0
191	Navigation/bombing/tactics trainer	71,72,82,003	41.3
191	Missile trainer specialist	82,003	53.8
193	Avionics instrument systems specialist	72,82	38.1
198	Medical equipment repairman	00,22,82	56.8
222	Air traffic control operator	19	54.8
232	Radio communications analyst	02,18,19,21,23	31.7
232	Voice processing specialist	02,13,18	32.1
233	Electronic emission monitor/analyst	00,72,82	37.2
241	Linguist/interrogator specialist	02,13,18	30.8
241	Imagery interpreter specialist	00,01,18	35.5
243	Intelligence operations specialist	00,02,16,18,20, 21,24	45.6
304	Orthopedic appliance specialist	71,078	00.0[b]
311	Medical laboratory specialist	02,04,07	83.5
311	Histopathology specialist	07	100.0
400	Precision photographic processor	97	28.1
411	Photogrammetric cartographer	00,01	28.1
412	Site development specialist	00,01	61.9
531	Data processing machine operator	16,21	77.7
531	Data systems analyst & designer	C12,02,21	100.0
532	Programming specialist	00,02,21	84.1
541	Real estate & cost management analyst	95	40.4
570	Information specialist	05,13,16,96	62.5
600	Aircraft maintenance specialist	62	15.5
610	Special vehicle repairman	62,70,80,84,86	36.7
612	Base maintenance equipment repairman	62,63	29.2

SOURCE: Winkler and Thompson.

[a]As specified in Air Force Manual (AFM)-39-1.

[b]Data based on one observation.

Table 9

OCCUPATIONAL DISTRIBUTIONS BY SPECIALTY: PERCENT OF SEPARATEES[a]

Civilian Occupational Groups	91B Medical Specialist	010 Infantry	63H Engine and Powertrain Repair	63B Wheel Vehicle Mechanic	800 Food General	121 Missile Guidance and Control
Professional 00-05 Sciences, professional		1.4		1.2	2.4	[8.3][b]
07 Medicine, health	[5.4]	.1				.9
09 Education	.7					
10-19 Art, library, entertainment, etc.	3.8	2.0	1.1	3.6	4.9	6.4
Clerical and Sales 20-29	18.1	13.4	11.2	9.7	7.3	
Service Occupation 30-38 (i.e., food preparation services, police and firemen, etc.)	21.5	6.6	2.2	5.5	[19.9]	5.5
Farming, Fishery, etc. 40-46		.9	2.2	3.4	1.8	
Processing 50-59	8.8	5.7	5.5	4.5	8.5	6.4
Machine Trades 60-69 (i.e., mechanics, etc.)	8.2	11.9	[25.9]	[24.1]	10.3	13.6
Bench Work 70-79 (i.e., electronics repair)	3.7	6.3	7.9	5.5	6.1	6.4
Structural Work 80-89 (i.e., construction)	10.7	25.6	18.9	16.2	13.0	18.6
Miscellaneous 90-97 (i.e., bus and truck drivers, graphic art, etc.)	16.1	21.1	21.3	22.1	24.3	16.7
Sample Size	128	414	88	137	160	106

SOURCE: Hassell and Nelson, pp. 16-17.

[a]High school graduates, not in education program, working full-time.

[b]The figures enclosed in boxes indicate the civilian occupations most comparable to the respective military specialty.

studies that use one-digit DOT codes (Tables 10 and 11).* As an alternative to one-digit DOT codes, Winkler and Thompson evaluate two-digit and three-digit occupational codes to aggregate individuals on the basis of the type of skills required for each category. (Tables 8 and 9 versus Tables 10 and 11). In this way they are able to facilitate their evaluation of the extent to which military skills are transferable to the civilian sector.

SUMMARY

With the exception of the studies by McCall and Wallace and by Winkler and Thompson, the general conclusion forthcoming from the available studies is that military training is not transferable to the civilian sector. However, since the findings offered by the above studies vary depending on the occupational groups examined, the method used to group civilian and military occupations, and the period in which the selected sample of individuals served their tours of duty, conclusive evidence on the association between the military occupations and post-service occupations of individuals is not provided. The only conclusion offered consistently by all of the above studies is that separatees in the more technical military specialties have a higher probability of continuing to work in the same occupation when they enter the civilian labor force than separatees in the less technical military specialties.

In examining the transferability issue, existing studies do not formulate a model of occupational choice. Consequently, none of the available studies takes into consideration the influence of such factors as prior civilian training on a separatee's choice of a post-service occupation. As an alternative approach to that of occupational choice, some studies focus on the effects of military training on the post-service earnings of individuals. These studies are evaluated next.

---

*It is not only difficult to assess the comparability of military and civilian groupings but, since different studies use alternative methods of aggregating occupational groups and varying levels of aggregation, it is difficult to compare the findings on the transferability of military skills across studies.

Table 10

AIR FORCE SPECIALTY CODES AND CIVILIAN OCCUPATIONS
(In percent)

Civilian Occupation	Air Force Specialty					
	Missiles/ Electronics	Weapons Maintenance	Crafts/Fire Protection	Transportation/ Cooks	Service Occupations	Aircrew/ Protection
Professional/ technical[a]	19.3	21.3	3.3	7.9	15.7	11.8
Managerial/ administration	6.1	8.2	2.5	10.5	7.8	8.8
Clerical/sales	8.8	6.6	15.0	23.7	19.6	23.5
Service	1.8	0.0	10.8	0.0	9.8	8.8
Farming/forestry	0.0	1.6	2.5	0.0	0.0	2.9
Processing	.9	1.6	5.8	0.0	3.9	2.9
Machine trades	17.5	26.2	27.5	21.1	19.6	14.7
Bench work	28.9	11.5	6.7	7.9	3.9	5.9
Structural work	3.8	0.8	17.5	7.9	3.9	5.9
Transportation/ miscellaneous	7.9	13.1	8.3	21.1	15.7	14.7
Sample size	114	61	120	38	51	34

SOURCE: Richardson (1966), Table 25, p. 149.

[a]Includes students.

Table 11

PRIMARY MILITARY SPECIALTY AND TYPE OF CIVILIAN JOB
(In percent)

Civilian Occupation	Military Specialty						
	Combat	Electronic Equipment Repairman	Communications and Intelligence	Medical and Dental	Other Technical	Electrical/ Mechanical Repairman	Craftsman
Professional	3	8	4	2	6	5	1
Business and managerial	11	6	14	2	14	7	8
Technical	4	31	10	35	20	4	4
Clerical	15	11	10	8	9	8	12
Sales	9	10	16	8	28	8	4
Skilled, semi-skilled	30	24	27	20	17	50	57
Service and other	28	10	19	25	6	18	14
Sample size	79	79	49	40	35	275	89

SOURCE: Sharp and Biderman, Table 103, p. 153.

IV. STUDIES USING STATISTICAL TECHNIQUES TO DETERMINE IF SEPARATEES RECEIVE ECONOMIC RETURNS TO MILITARY TRAINING

INTRODUCTION

The economic effect of military training has been evaluated by existing studies using two basically different data bases. First, the earnings of separatees with military vocational training are compared to the earnings of similar veterans from the infantry. Second, the earnings of veterans and comparable nonveterans are evaluated to determine if the loss of civilian work experience is compensated for by military-acquired training. Using these two approaches, previous studies have analyzed the extent to which separatees receive a positive economic return from military vocational training.

If investment in military vocational training increase the productivity of veterans who are employed in civilian occupations, it will also have a positive effect on the earnings of these individuals, as is supported by human capital theory. Therefore, post-service earnings are used in these studies to measure the economic benefits provided to separatees from military vocational training. These studies evaluate the economic returns to military training using multiple regression analysis to standardize or control for the influence of other factors that affect productivity and thereby earnings.

STUDIES THAT COMPARE DIFFERENT COHORTS OF VETERANS

Weinstein et al. focus on the economic effect of military vocational training on the post-service earnings of veterans. Army and Navy separatees were asked if they used their military training in their post-service occupations in the three years following the separation of veterans in the sample from active duty.

Weinstein et al. find that individuals who use their military training earn significantly more than those who do not. This seems to support the hypothesis that separatees who use their military training in their civilian jobs receive a positive return to military vocational training. However, Weinstein et al. also find that separatees with both

pre-military and military training related to their post-service jobs tend to have lower earnings than separatees with related pre-military training who were not in similar military specialties. This implies that military vocational training has a negative effect on the post-service earnings of veterans. Since separatees who enter post-service occupations related to their military training have a greater probability of doing so if they have been employed in related pre-service civilian jobs, Weinstein et al. are led to conclude that where income is affected it is due to the pre-military work experience acquired by separatees rather than to their military training.

Although the opportunity cost of changing occupations is higher for individuals with both pre-service and service training in the same occupation, this does not provide substantive evidence that separatees benefit from civilian training but not military training. Weinstein et al. do not attempt to statistically control for pre-service civilian training while concurrently evaluating the economic effect of military vocational training. As a consequence of the manner in which the empirical study is structured, their report does not offer conclusive evidence on the economic effect of military training. In addition, they make no attempt to formulate a statistical test of the returns to additional amounts of formal and informal military and civilian training that is used in post-service occupations.

Using the same data as Weinstein et al., Kassing also evaluates the earnings of vocationally trained Army separatees and compares them with the earnings of infantrymen. Kassing concludes, as do Weinstein et al., that vocationally trained separatees do not receive higher earnings than ex-infantrymen who did not undergo military training transferable to the civilian sector.

A third study that offers some evidence on the effects of military vocational training is made available by Freeman. Using data on white Army veterans who served in the pre-World War II and World War II periods, Freeman finds that although most types of formal civilian occupational training have a positive effect on earnings, training received in the Army does not. Freeman's concern is with the very broad and general effects on earnings from formal vocational training acquired

by individuals in various institutions. Consequently, he aggregates training in different occupational groups and does not distinguish between different amounts or types of military training. In addition, no distinction is made between individuals who use their training in their current occupations and those who do not.

Hanushek focuses on differentials in earnings across geographical labor markets. Using the Post-Service File, data on 180,000 separatees who left the Army during FY 1969 after two years or less of active duty are obtained ten months after they separated. Hanushek indicates that the military occupation of an individual does not have a significant impact on earnings.* He suggests this result is probably due to the low level of military training acquired by individuals in his sample. Since the sample consists of separatees who served only two years or less of active duty, they are less likely to have had extensive technical training. In addition, Hanushek does not distinguish between individuals who use their training in their current occupations and those who do not. He also assumes that individuals within the same one-digit DoD code receive equal amounts of formal military training.

Mason's (1970) analysis of the May 1964 Current Population Survey of men under 35 years of age indicates that the military occupation and length of service of individuals do not have a positive effect on the income of separatees when they enter the civilian labor market. His sample consists of 1,454 veterans who are employed full-time and not enrolled in school. Since Mason is interested in the effect military service has on the socioeconomic status of veterans, occupations are classified into ten major census groups by socioeconomic rankings. The comparability of civilian occupations and military skills is determined by these rankings of general occupational socioeconomic standing. He concludes that military training does not result in a positive economic return to veterans. In fact, Mason concludes that there is a negative return to military training. He attributes this result to the fact

---

*It should be noted that the timing of the surveys relative to the separation date of individuals may affect the conclusions of the available studies interested in the effects of military service on the post-service opportunities of separatees.

that the military experience of an individual takes away from the time that could be spent obtaining civilian labor force experience.

Neither Mason nor the above studies differentiate between individuals who use their military-acquired skills in their current occupations and those who do not. McCall and Wallace indicate that the earnings of separatees are positively and significantly associated with whether or not they use their Air Force training. Using a sample of Air Force-trained electronic specialists, McCall and Wallace find that the civilian earnings of separatees in their sample are significantly higher for those who enter related civilian occupations.

STUDIES THAT COMPARE VETERANS WITH NONVETERANS

Kassing attempts to evaluate the returns to military vocational training by comparing veterans with nonveterans who are employed in the civilian sector. Kassing uses a subsample of 8,104 veterans from the one percent sample of 1953 Selective Service System Records and data from the Social Security Administration. The sample consists of separatees who served one term of active duty during the Korean War. Data were obtained for individuals three to four years after and also nine to ten years after their separation dates.

Kassing finds that military service does not result in a significant wage differential as a consequence of military vocational training. However, he makes no distinction between the type of military training, the current occupation, or the relationship of the military training to the current occupation of individuals in the sample. Moreover, in comparing veterans with nonveterans, infantrymen who did not receive vocational training are included in the veteran sample.

Drawing from the same data sources used by Kassing, Cutright's sample includes only those veterans who served two years in the military during the 1949-1953 period. As in Kassing's study, data were also taken three to four years after and nine to ten years after the date of separation of veterans. The sample consists of 5,972 whites and 1,650 blacks. Cutright is interested in evaluating the factors that affect earnings. He is particularly concerned with the impact of general military service on the civilian earnings of separatees and

how the effect of military service on earnings changes over time. Since he is not interested in the different effects of military service that result from acquiring various types of military training, the data are not disaggregated by occupational groups. By comparing the earnings of veterans with similar nonveterans as Kassing does, Cutright also concludes that the positive effects of military training do not overcome the negative effects that result from being out of the civilian labor market.

SUMMARY

A number of considerations must be dealt with in evaluating the extent to which previous studies have presented conclusive evidence on the economic effects of military training on the civilian earnings of veterans. One important aspect that must be taken into account in evaluating the conclusions reached by various studies is related to the data bases used. Hanushek's sample, for example, consists of separatees who have had only two years or less of active duty. They are, therefore, less likely to have had any extensive amount of technical training in the military. Other studies use samples that consist of a large percentage of separatees who were inducted into the service during or prior to the Korean War.* During this time, intensive military training in civilian-related skills may have been less prevalent than during peacetime periods.

Second, the earnings of former military personnel may depend on the type and amount of military training received and the relationship of this training to the current occupation of individuals. Moreover, the return to training may differ across occupational groups. The return to training for any one specific military specialty may not be discernible if all military-trained separatees are aggregated and assumed to be homogeneous.

Of the studies that distinguish between various types of training or amounts of military training, none have effectively considered the

*For a comparison of the characteristics of the samples used by each of the studies discussed above, see Table 1.

return to training for separatees who use their military-acquired skills in the civilian sector compared to the return for those who do not. As a consequence of insufficient data on the type and amount of pre-service training, which may affect the conclusions of studies based on empirical tests of the economic effect of military training, previous studies have not been able to offer conclusive evidence on the economic returns to specific types and amounts of military training.

V. ON-GOING RESEARCH ON THE RETURNS TO MILITARY TRAINING

The available theoretical evidence suggests that the wages of individuals reflect their productivity. Changes in productivity resulting from military training may therefore be measured by comparing the wage differentials of different cohorts of individuals. Given the absence of detailed data on the work histories of nonveterans, comparisons of different cohorts of veterans can be used to measure the effect of military training on productivity. Separatees from military specialties related to their current civilian occupations, for example, could be compared to individuals in the same occupation who did not acquire related military training.

None of the available studies have fully addressed the issue of the potential economic returns to military training that accrue to individuals who use military-acquired skills in post-service occupations. Moreover, previous studies have not been able to observe the effect of formal and informal military vocational training while concurrently controlling for other factors that may influence their conclusions--such as skills acquired in the civilian sector, which may be substitutes or complements for military training. In the same context, when the military experience of individuals is viewed, in total, as the length of time spent in active duty, no consideration is given to the extent of formal compared to informal military training acquired by individuals. Instead, a distinction needs to be made between the amount of time spent in formal military training, the amount of time spent working in the military, and the type of military and job experience acquired. That is, it is likely that enlistees who served in the military as cooks, for example, have different opportunities than comparable individuals who served their tours of duty in more technical military specialties.

Two of these studies evaluate the economic effects of military vocational training by using infantrymen as a control group under the assumption that infantrymen do not receive military training that can potentially be used in the civilian sector. These studies do not

consider the possibility that training in other military specialties besides the infantry may not have civilian counterparts. Moreover, since infantrymen constitute a disproportionate percentage of draftees, they may be an inadequate control group for evaluating the economic effects of specific types of military training. As an alternative, a companion Rand study (Norrblom, 1976) uses earnings data for selected civilian occupations to compare separatees who acquired military vocational training and use it in their current occupations with those who did not receive related military training.

Many issues on the effects of military training remain to be evaluated. Without these additional considerations, the available evidence is not sufficient to support any firm conclusions on the economic effect of military vocational training. These considerations include the returns to specific types of military training, the returns to military training for separatees who use their military-acquired skills in their post-service occupations compared to those who do not, the returns to formal as compared to informal military training, and the consideration of military training as a complement to or substitute for civilian training. These issues are addressed in the companion report cited above.

BIBLIOGRAPHY

Bateman, C. W., "Formal and On-the-Job Training in Military Occupations," Office of the Assistant Secretary of Defense, Manpower SS&R, Washington, D.C., September 16, 1965, unpublished.

Becker, Gary S., *Human Capital, A Theoretical and Empirical Analysis with Special Reference to Education,* Columbia University Press for the National Bureau of Economic Research, New York, 1964.

Benewitz, Maurice C., and Albert Zucker, "Human Capital and Occupational Choices--A Theoretical Model," *Southern Econ. J.*, Vol. 34, No. 3, January 1968, p. 406.

Biderman, Albert D., and Laure M. Sharp, "The Convergence of Military and Civilian Occupational Structures: Evidence from Studies of Military Retired Employment," *Amer. J. Soc.*, Vol. 73, No. 4, January 1968, pp. 381-399.

Cain, Glen, W. Lee Hansen, and Burton A. Weisbrod, "Occupational Classification: An Economic Approach," *Monthly Labor Rev.*, Vol. 90, No. 2, February 1967, pp. 48-52.

Clark, Harold F., and Harold S. Sloan, *Classrooms in the Military,* Bureau of Publications, Teachers College, Columbia University, New York, 1964.

Clary, James N., *Training Time and Costs for Navy Ratings and NECS,* Naval Personnel Research and Development Laboratory, Department of the Navy, Washington, D.C., WOS 71-1, July 1970.

The College Placement Council, *Men's Salary Survey, A Study of 1970-1971 Beginning Offers by Business and Industry,* Report No. 2, Bethlehem, Pennsylvania, March 1971.

Cutright, Phillip, *Achievement, Mobility and the Draft: Their Impact on the Earnings of Men,* Social Security Administration, U.S. Department of Health, Education, and Welfare, Washington, D.C., DHEW Publication No. (SSA) 73-11854, June 1972.

Dunlop, John T., "The Task of Contemporary Wage Theory," in J. T. Dunlop (ed.) *The Theory of Wage Determination,* Macmillan, London, 1957.

Eckaus, R. S., "Economic Criteria for Education and Training," *Rev. Econ. Stat.*, Vol. 46, No. 2, May 1964, pp. 181-190.

Fine, Sidney A., "The Use of the Dictionary of Occupational Titles as a Source of Estimates of Educational Training Requirements," *J. Human Res.*, Vol. 3, No. 3, Summer 1968, pp. 363-375.

Freeman, Richard, "Post-School Investments in Occupational Training," Memo of Paper Presented at Workshop in Application of Economics, University of Chicago, October 30, 1972.

Gilman, Harry J., "Military Manpower Utilization," in Stephen Enke (ed.), *Defense Management*, Prentice-Hall, Inc., New Jersey, 1967.

Gitelman, H. M., "An Investment Theory of Wages," *Industrial Labor Relations Rev.*, Vol. 21, No. 3, April 1968, pp. 323-352.

Goldberger, Arthur S., *Econometric Theory*, John Wiley and Sons, New York, 1964.

Griliches, Zri, and William M. Mason, "Education, Income and Ability," *J. Polit. Econ.*, Vol. 80, May-June 1972, pp. S74-S103.

Gruskin, Denis M., "Problems of Gathering Occupational Data by Mail," *Monthly Labor Rev.*, Vol. 94, No. 10, October 1971, pp. 18-20.

Hanoch, Giora, "An Economic Analysis of Earnings and Schooling," *J. Human Res.*, Vol. 2, Summer 1967, pp. 310-329.

Hanoch, Giora, "Personal Earnings and Investment in Schooling," unpublished Ph.D. dissertation, University of Chicago, 1965.

Hanushek, Eric A., *Regional Differences in the Structure of Earnings*, Office of Economic Research, Economic Development Administration, Department of Commerce, Washington, D.C., 1972.

Harding, Francis D., and John A. Richards, *A Descriptive Analysis of the Classification, Assignment, and Separation Systems of the Armed Forces*, Human Resources Research Organization, Manpower Development Division, Alexandria, Virginia, AFHRL-TR-71-15, May 1971.

Johnston, J., *Econometric Methods*, McGraw-Hill, New York, 1964.

Jurkowitz, Eugene Lewis, "An Estimation of the Military Contribution to Human Capital," unpublished Ph.D. dissertation, Columbia University, 1968.

Kassing, David B., "Military Experience as a Determinant of Veterans' Earnings," *Studies Prepared for the President's Commission on an All-Volunteer Armed Force*, Vol. 2, Part 3, No. 8, Washington, D.C., November 1970, pp. 8-22.

Mason, William, "On the Socioeconomic Effects of Military Service," unpublished Ph.D. dissertation, University of Chicago, 1970.

Mason, William, "Preliminary Analyses of Social Attainment of White Males in the CPS Sample of the 1964 Department of Defense Surveys, with Special Attention to the Relation Between Achievement Before Service and Achievement in Military Service, and Between These Two Points and Achievement After Military Service," July 1968, unpublished.

Massell, Adele P., and Gary R. Nelson, *The Estimation of Training Premiums for U.S. Military Personnel*, The Rand Corporation, P-5250, June 1974.

McCall, John, and Neil Wallace, *Training and Retention of Air Force Airmen: An Economic Analysis*, The Rand Corporation, RM-5384-PR, August 1967.

Mincer, Jacob, "On-the-Job Training: Costs, Returns, and Some Implications," *J. Polit. Econ.*, Vol. 70, No. 5, October 1962, pp. 50-79.

Morgan, James, and Martin David, "Education and Income," *Quart. J. Econ.*, Vol. 77, August 1963, pp. 423-437.

Nathan Associates, Inc., *Transferability of Military-Trained Medical Personnel to the Civilian Sector*, Office of Manpower Research, U.S. Department of Labor, Washington, D.C., PB 192 690, July 1970.

Norrblom, Eva M., *An Analysis of the Economic Returns to Military and Civilian Training*, Ph.D. dissertation, University of Southern California, March 1976.

Norrblom, Eva M., *The Returns to Military and Civilian Training*, The Rand Corporation, R-1900-ARPA, July 1976.

Oi, Walter V., "Labor as a Quasi-Fixed Factor of Production," *J. Polit. Econ.*, Vol. 70, No. 6, December 1962, pp. 538-555.

Parnes, H. S., et al., *The Pre-Retirement Years: A Longitudinal Study of the Labor Market Experience of the Cohort of Men 45-59 Years of Age*, Vol. 1, Ohio State University Center for Human Resource Research, Columbus, 1968.

Richardson, Robert B., "An Examination of the Transferability of Certain Military Skills and Experience to Civilian Occupations," unpublished Ph.D. dissertation, Cornell University, 1966.

Richardson, Robert B., *Transferring Military Experience to Civilian Jobs: A Study of Selected Air Force Veterans*, Department of Labor, Manpower/Automation, Research Monograph No. 8, Washington, D.C., 1967.

Scoville, James G., "Education and Training Requirements for Occupations," *Rev. Econ. Stat.*, Vol. 48, No. 4, November 1966, pp. 387-394.

Scoville, James G., *Manpower and Occupational Analysis: Concepts and Measurements*, D. C. Heath and Company, Lexington, Massachusetts, 1972.

Sharp, Laure M., and Albert D. Biderman, *The Employment of Retired Military Personnel*, Bureau of Social Science Research, Inc., Washington, D.C., July 1966.

Smith, Gorman, "Occupational Pay Differentials for Military Technicians," unpublished Ph.D. dissertation, Department of Economics, Columbia University, April 1964.

Taubman, Paul J., and Terence J. Wales, "Higher Education, Mental Ability and Screening," *J. Polit. Econ.*, Vol. 81, No. 1, January-February 1973, pp. 28-55.

Taylor, G. W., and F. C. Pierson (eds.), *New Concepts in Wage Determination*, McGraw-Hill, New York, 1957.

Theil, Henri, *Principles of Econometrics*, John Wiley and Sons, New York, 1971.

Thorndike, Robert G. L., and Elizabeth P. Hagen, *An Exploratory Survey of Civilian Experience Related to Military Jobs*, Air Training Command, Human Resources Research Center, Lackland Air Force Base, Texas, Research Bulletin 50-20, June 1952.

Thorndike, Robert G. L., and Elizabeth P. Hagen, *Attitudes, Educational Programs and Job Experiences of Airmen Who Did Not Reenlist*, Air Force Personnel and Training Research Center, San Antonio, Texas, AF-18(600)-1359, June 1957.

U.S. Congress, Senate Committee on Armed Forces, *A Study of the Military Retired Pay System and Certain Related Subjects*, prepared by the Study Committee at the University of Michigan, July 6, 1961.

U.S. Department of the Air Force, *Military Classification Manual*, Air Force Manual (AFM)-39-1, Vols. I and II., Washington, D.C., December 1969.

U.S. Department of Commerce, Bureau of the Census, *1970 Census of Population, Occupation by Industry*, PC(2)-7C, U.S. Government Printing Office, Washington, D.C., October 1972.

U.S. Department of Commerce, Bureau of the Census, *National Longitudinal Survey of Work Experience of Males, 14-24 and 45-59* (Tape), Washington, D.C., 1966-69.

U.S. Department of Commerce, Bureau of the Census, *Public Use Samples of Basic Records from the 1970 Census, Description and Technical Documentation*, Social and Economic Statistics Administration, U.S. Government Printing Office, Washington, D.C.

U.S. Department of Defense, *Military-Civilian Job Comparability Manual: A Guide for Employers, Vocational Counselors and Others Concerned with Employment of Veterans*, Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs), Washington, D.C., March 1972.

U.S. Department of Defense, *Post-Service Information File*, and *End-of-Service File* (Tape), Washington, D.C., 1971.

U.S. Department of Defense, *Occupational Conversion Table (Enlisted Men)*, Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs), Washington, D.C., DA PAM 611-12, October 1971.

U.S. Department of Labor, *Dictionary of Occupational Titles*, (3d ed.), U.S. Government Printing Office, Washington, D.C., 1965.

U.S. Department of Labor, "Veterans Bring Skills to the Labor Market," *Employ. Security Rev.*, Vol. 30, No. 7, U.S. Government Printing Office, Washington, D.C., July 1963, pp. 1-40.

U.S. Department of Labor, Bureau of Employment Security, *Estimates of Worker Traits Requirements for 4000 Jobs*, U.S. Government Printing Office, Washington, D.C., 1956.

U.S. Department of Labor, Bureau of Labor Statistics, *Wage Differences Among Metropolitan Areas, 1969-1970*, U.S. Government Printing Office, Washington, D.C., March 1971.

U.S. Department of Labor, Bureau of Labor Statistics, *Wages and Related Benefits, Part II: Metropolitan Areas*, U.S. Regional Summaries, Government Printing Office, Washington, D.C.

U.S. Department of Labor, Manpower Administration, *Career Thresholds: A Longitudinal Study of the Educational and Labor Market Experience of Male Youth*, Vols. 1 and 2, October 1970; Vol. 3, May 1970, Vol. 4, January 1973, U.S. Government Printing Office, Washington D.C.

Weinstein, Paul A., "Occupational Crossover and Universal Military Training," in Sol Tax (ed.), *The Draft, A Handbook of Facts and Alternatives*, University of Chicago Press, 1967.

Weinstein, Paul A., et al., *Final Report of the Military Training Study, Labor Market Activity of Veterans: Some Aspects of Military Spillover*, University of Maryland, Washington, D.C., June 1969.

Weinstein, Paul A., and Eugene L. Jurkowitz, "The Military as a Trainer: A Study of Problems in Measuring Crossover," *Proceedings of the Social Statistics Section of the American Statistical Association*, 1967, pp. 126-131.

Weintrab, Sidney, *Some Aspects of Wage Theory and Policy*, Chilton Books, Philadelphia, 1963.

White, Stephanie, "The Process of Occupational Choice," *British J. Industrial Relations*, Vol 6, No. 2, July 1968.

Winkler, Anthony J., and Paul D. Thompson, *Post Service Utilization of Air Force-Gained Skills*, Air Force Human Resources Laboratory, Manpower Development Division, AFHRL-TR-71-2, September 1971.

Wool, Harold, "The Armed Services as a Training Institution," in Eli Ginzberg (ed.), *The Nation's Children*, Columbia University Press, New York, 1959.

Wool, Harold, *The Military Specialist: Skilled Manpower for the Armed Forces*, Johns Hopkins Press, Baltimore, 1969.